Survey and Analysis of the Scioto Brush Creek Drainage Fish Fauna of Southern Ohio[1]

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ABSTRACT. **The fish fauna in the Scioto Brush Creek watershed of south-central Ohio was sampled using a 1.8 m by 3.0 m, 4.8 mm mesh seine. The purpose was to determine if a quick, economical, survey of this type would provide an accurate assessment of the fish communities in the basin. A total of 47 species plus three hybrids representing 6684 individuals were captured at a total of 19 sites in seven streams during this survey. Two of the species captured in this study (warmouth [*Lepomis gulosus*] and dusky darter [*Percina sciera*]) were new records for the drainage. Another significant addition to the fauna was the collection of the popeye shiner (*Notropis ariommus*) at five sites in the lower mainstem of Scioto Brush Creek. This Ohio endangered species ranked eighth in abundance among the 47 species of fish collected in Scioto Brush Creek. Prior surveys dating back to 1921 had documented the occurrence of 67 species in this drainage. This study raises the known fish fauna in the drainage to 69 species. The results of this survey, coupled with electrofishing and hoop net data collected by other biologists between 1979 and 1985, when compared to surveys conducted prior to 1955 by Trautman, indicate that the original fish community of Scioto Brush Creek is still intact. Of the 60 species recorded for the drainage by Trautman (1981), it appears that only the bigeye chub (*Notropis amblops*) has disappeared from the system. The bluntnose minnow (*Pimephales notatus*) and striped shiner (*Luxilus chrysocephalus*) were the dominant members of the fish community in the mainstem and South Fork of Scioto Brush Creek during the 1985 survey followed by the brook silverside (*Labidesthes sicculus*), spotfin shiner (*Cyprinella spiloptera*) and longear sunfish (*Lepomis megalotis*).**

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INTRODUCTION

Scioto Brush Creek is a moderate-sized, compact drainage found in the unglaciated Allegheny Plateau section of southern Ohio. It empties into the lower Scioto River on its west side approximately 14.7 km upstream from the Scioto's confluence with the Ohio River. Compared to other drainages in Ohio, the fish fauna of Scioto Brush Creek has historically attracted less attention from ichthyologists and fishery biologists throughout the state. This modest amount of sampling made Scioto Brush Creek an ideal study stream on which to attempt a rapid once over survey using seines to achieve an efficient, economical sampling methodology.

The overall objective of this study was to obtain a set of numerical data taken in a timely and inexpensive manner that could be used to: (1) characterize the fish community present in Scioto Brush Creek and; (2) establish baselines for a long-term program which would monitor the status of resident fish populations in the stream at approximately 10 year intervals. These data in turn would be available to future investigators interested in measuring changes in the fish populations of Scioto Brush Creek or in monitoring populations of state listed species. From previous survey work it was already known that one rare species, the rosyside dace (*Clinostomus funduloides*) was a common inhabitant of some of the smaller tributaries of this drainage (Rice and Phinney 1985). In 1984 a second rare species, the popeye shiner (*Notropis ariommus*) was collected in the South Fork of Scioto Brush Creek near Otway, Ohio, by Roger Thoma of the Ohio EPA. Prior to the OEPA collection the popeye shiner was known for the state solely on the basis of two specimens collected by Kirsch (1895) in the Maumee River near Antwerp, Ohio, Paulding County in 1893.

Previous Surveys

The earliest known sampling records for Scioto Brush Creek are two collections made by Edward Wickliff in 1921. One collection was located at Arion, Ohio, and the second at McDermott, Ohio. These two samples together contain 24 species. Milton Trautman periodically sampled Scioto Brush Creek over a period of more than forty years. He last sampled the mainstream during his Ohio Stream Survey of 1963. Results of previous sampling efforts are found in Trautman (1981) where he lists 45 species on his distribution maps for the mainstem of Scioto Brush Creek including the records made by Wickliff. Three other collections were made in the drainage by state biologists (OEPA and ODOT) between 1979 and 1984. Collectively these samples recorded a total of 42 species. In 1985 the Ohio Division of Wildlife set a hoop net in the lower mainstem resulting in the capture of 15 species.

Physical Features of the Scioto Brush Creek Drainage

Scioto Brush Creek drainage encompasses approximately 71,637 ha of the Scioto River basin in south-central Ohio. Most of the drainage area is contained

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within Scioto and Adams counties. This part of the Scioto basin lies within the Mississippian Waverly Series of shales and sandstones (Pepper and others 1954). The lower part of the main channel of Scioto Brush Creek has cut deeply into the Bedford and Berea formations. The upper valleys (branches) of Scioto Brush Creek show exposures of Devonian black shales which underlie the Mississippian formations. Where the easily eroded black shales are exposed, the valleys have broadened out unlike the narrow valley of the lower mainstem. Some of the uppermost tributaries—for example Turkey Creek, Dunlap Creek, and Mill Creek—have bedrock channels of Silurian age limestone (Swinford 1985). However, in the mainstem channel itself, Scioto Brush Creek takes its character from the resistant Bedford and Berea sandstones. The landform created is one of heavily dissected topography with deep steep-sided valleys and sharp ridged hills in between. Tributary divides have summits between 308 and 338 km above sea level. The similarity in height of the summits within the watershed show the drainage was carved into an uplifted plain that tilts slightly to the east. As a consequence of this tilting younger rocks of Mississippian age are exposed to the east at the lower end of the drainage and older rocks of Devonian and Silurian ages are exposed to the west in the headwater areas.

The drainage pattern created by the channel of Scioto Brush Creek is Y-shaped with a 28.8 km lower (sixth order) section which extends from Otway to Rushtown forming the stem of the Y and two arms of about equal length forming the forks. USGS topographical maps show the main channel extends to the northwest for about 10.2 km (to the confluence of Rarden Creek) as a fifth order stream. The change from fourth to fifth order takes place at river mile 22.3 and from third to fourth at river mile 32.3 (confluence of Betty's Creek). Major fourth order tributaries for the entire drainage are shown in Fig. 1. The South Fork of Scioto Brush Creek extends southwestward near the town of Otway for 29.1 km and is paralleled by State Highway 348. It also is a fifth order stream. The change from fourth to fifth order occurs at South Fork river mile 11.8 (confluence of Churn and Mill Creeks).

The valleys of Upper Scioto Brush Creek and its South Fork are similar in physical characteristics having broad flat valleys and meandering stream channels. Both valleys are partly filled with clay deposits (probably of Glacial Lake Tight) lying underneath thick late Pleistocene alluvium. The stream channels have cut through the alluvium into the clay layer but have not yet reached the bedrock floor of the main valley. At the confluence with South Fork at Otway the clay deposits are deeply eroded and undercut providing excellent pool habitat. Riffles, however, are poorly developed upstream from Otway in both channel arms. Those riffles that do exist are composed of small cobble and gravel derived from the alluvial terraces.

The valley of the mainstem between Otway and Henley is similar to that just described for the South Fork arm. It is broad due to exposure of easily eroded shales in the valley walls and it is also flat containing much valley fill including clay deposits. In that part of the mainstem channel extending from Arion downstream to its confluence with the Scioto River at Rushtown stream characteristics are quite different than described above. Here the channel, which includes large reverse bends, is deeply entrenched in erosion resistant sandstone of the Berea Formation. Valley walls are very steep and much of the channel flows directly on the bedrock. In some places, such as downstream from McDermott, the ledge-forming characteristic of the sandstone has created small, low waterfalls with large deep pools cut in the rock below the falls. Riffles formed by exposed rock ledges and bedrock debris have created a type of riffle habitat not seen further upstream. Such a riffle is displayed in the main channel immediately upstream from State Route 104 at Rushtown. Here the stream has eroded long series of ledges followed by a low drop over a shelf into a deep pool.

Past and current landuse patterns in the Scioto Brush Creek watershed can be described as predominately forested with an intermixture of agriculture. The area is rural in nature and sparsely populated with only a few small towns located in the drainage. At the present time there are no discharges to the stream from chlorination plants or industrial users which in many other drainages around the state has impaired both the water quality and the biological integrity of the receiving streams.

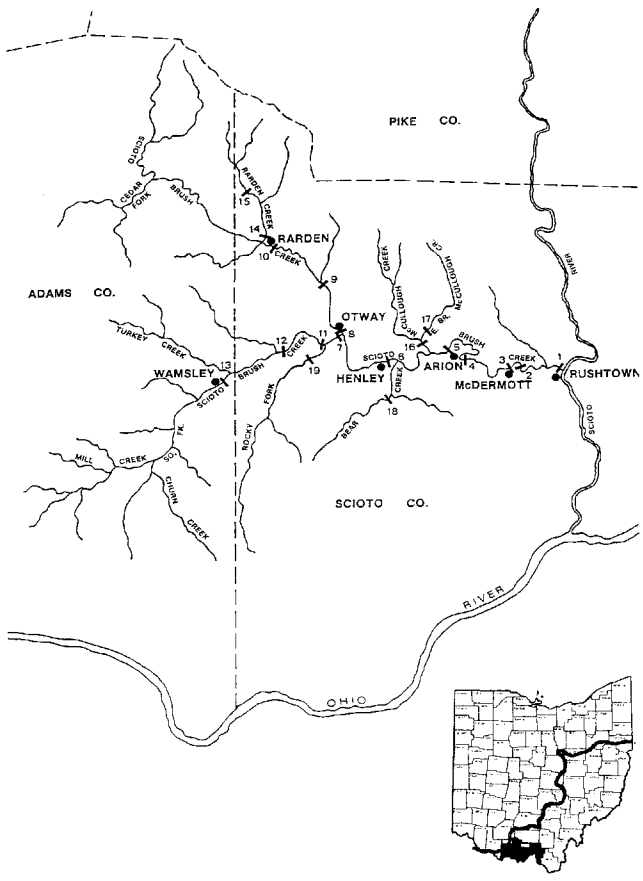

FIGURE 1. Map of the Scioto Brush Creek drainage showing major streams, towns (closed circles), and collecting stations (bars).

MATERIALS AND METHODS

Sampling Methodology

Sampling sites in this study were selected for ease of access and number of fish habitats present. Most sites were near road bridge crossings or where road access approached the stream. Sampling was conducted during daylight hours only between mid-September and the end of October. Each station was sampled with a 1.8 m x 3.0 m straight minnow seine having a 4.8 mm mesh and double weights on the lead line. Three persons did the sampling—two on the net and one taking data on kinds and number of fish captured. All habitats were exhaustively seined except the deep pool habitat which could not be reached by this method. Standardization of effort was based on a complete sample being made when all habitats at the station which were accessible to seining had been worked. Sampling time for the majority of sites was around an hour with the smaller tributaries requiring less time. This type of sampling works best for small fish species and young-of-the-year (YOY). Therefore the fall season is the best time to conduct a survey of this nature due to low flows and the presence of larger YOYs. Of particular importance is the information this survey methodology provides on resident fish species (those that reproduce in the habitats surveyed and are not simply transients).

After identification in the net all specimens were released except those retained for vouchers. The latter have been cataloged into the research collection of fishes in the Ohio State University Museum of Zoology (OSUM). Species nomenclature follows Robins and others (1991).

Calculations for Faunal Similarity and Community Relatedness

The structure of the fish community in Scioto Brush Creek was characterized using several analytical methods. The faunal similarity and community relatedness between the sampling stations was determined utilizing a matrix method known as a trellis diagram as described by Sanders (1960). Using the formula $R = [C(N_1+N_2)/2*N_1*N_2] (100)$, where C = number of species in common to both samples and N_1 and N_2 = the total number of species at each sample site, a value called the "index of affinity" is calculated for all possible pairs. The index of affinity is a measure of the percentages of the fauna common to a pair of samples. The higher the index of affinity, the closer the two samples are in their species composition. For those collections determined to represent the same community on the basis of their faunal similarities, we then organized the numerical data into tables that reflect fish community characteristics and structure.

Community structure was determined using two different methods for comparative purposes. Community is defined in this study to mean a group of species that show a high degree of association by tending to reoccur together. Using procedures set forth by Sanders (1960) the frequency of a given species appearing as one of the 10 most abundant species at a sample site was determined and a Biological Index Value (BIV) for each species was then calculated. The BIV is a measure of the quantitative importance of a species in the overall community composition. The community structure based on species ranked according to their BIV scores was then compared to the more traditional community structure approach in which species are ranked according to their numerical abundance. The early workers did not list the number of individuals captured with their species lists so there is no information on relative abundance to compare with our data.

RESULTS

Our survey in 1985 required four field days during which time 19 collecting sites within the Scioto Brush Creek drainage were sampled (Table 1, Fig. 1). A total of

TABLE 1

Collection sites for the 1985 fish survey in the Scioto Brush Creek drainage.

Site	Locality
	SCIOTO BRUSH CREEK MAINSTEM
Station 1	Rt. 104 bridge and 200 yds upstream to riffle above bend, Rush Twp., Scioto Co. 1 collection
Station 2	South arm of a reverse bend 2 mi. below bridge at McDermott, Ohio, Rush Twp., Scioto Co. 1 collection
Station 3	Along McDermott-Rushtown Rd. 1/2 mi. upstream of the bridge at McDermott, Ohio, Rush Twp., Scioto Co. 1 collection
Station 4	Bridge on Twp. Rd. 123, Union Twp., Scioto Co. 1 collection
Station 5	Arion Rd. bridge at Arion, Ohio, Union Twp., Scioto Co. 3 collections
Station 6	Rt. 73 bridge at Henley, Ohio, Union Twp., Scioto Co. 1 collection
Station 7	Confluence with South Fork of Scioto Brush Creek at Otway, Ohio, Brush Creek Twp., Scioto Co. 1 collection
Station 8	Covered bridge at Otway, Ohio 1/4 mile upstream confluence with South Fork Scioto Brush Cr., Brush Creek Twp., Scioto Co. 1 collection
Station 9	Ford crossing behind the church at Youngs, Ohio, Brush Creek Twp., Scioto Co. 1 collection
Station 10	Bridge on Co. Rd. 39 at Rarden, Ohio, Rarden Twp., Scioto Co. 1 collection
	SOUTH FORK SCIOTO BRUSH CREEK
Station 11	Bridge on Rocky Fork Rd., Brush Creek Twp., Scioto Co. 1 collection
Station 12	Along east side of Rt. 348 ca. 1 mile downstream from Jones Knob at farmer's ford, Brush Creek Twp., Scioto Co. 1 collection
Station 13	Rt. 348 bridge at Wamsley, Ohio, Jefferson Twp., Adams Co. 1 collection
	FEEDER STREAMS TO SOUTH FORK AND MAINSTEM SCIOTO BRUSH CREEK
Station 14	Rarden Creek at Rt. 73 bridge, Rarden, Ohio, Rarden Twp., Scioto Co. 1 collection
Station 15	Rarden Creek 1/2 mile upstream from Mustard Hill Rd. along Scioto Co. Rd. 37 (T128) on the Adams/Scioto Co. line. 1 collection
Station 16	McCullough Creek at confluence with East Branch of McCullough Creek, downstream from bridge on Henley Deemer Rd., Union Twp., Scioto Co. 1 collection
Station 17	East Branch McCullough Creek at Diehlman Rd. bridge, Union Twp., Scioto Co. 1 collection
Station 18	Bear Creek at bridge on Rt. 73, Union Twp., Scioto Co. 1 collection
Station 19	Rocky Fork Creek 3/4 mile upstream from confluence with South Fork Scioto Brush Creek, Brush Creek Twp., Scioto Co. 1 collection

6,684 individuals representing 47 species of fish plus three hybrids were captured at these 19 sites during the study (Table 2). Two of the species, the warmouth (*Lepomis gulosus*) and dusky darter (*Percina sciera*) were first records for the drainage (Table 3). The popeye shiner (*Notropis ariommus*), previously taken in the drainage by OEPA in the South Fork of Scioto Brush Creek near Otway, Ohio, on 7 August and 24 September

TABLE 2

The fish fauna of the Scioto Brush Creek drainage.

Species	Station Number																		Total
	1	2	3	4	5*	6	7/8	9	10	11	12	13	14	15	16	17	18	19	
Lampetra aepyptera	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	3
Esox americanus	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	–	–	2
Campostoma anomalum	25	2	4	22	20	3	16	10	1	7	1	–	1	8	1	–	–	–	121
Clinostomus funduloides	–	–	–	–	–	–	–	–	–	1	–	–	22	101	–	–	–	–	124
Notropis buccatus	–	–	–	–	–	–	–	37	–	2	–	–	1	21	–	–	–	4	65
Nocomis micropogon	8	–	–	4	1	–	2	23	–	11	–	–	–	–	–	–	–	–	49
Lythrurus ardens	–	–	–	3	14	1	20	4	12	55	26	69	–	–	22	3	28	145	402
Notropis ariommus	–	42	–	68	45	10	9	–	–	–	–	–	–	–	–	–	–	–	174
Luxilus chrysocephalus	8	18	31	32	132	67	50	70	20	678	12	–	91	19	91	4	–	45	1368
Notropis photogenis	2	5	1	–	–	–	16	–	3	8	7	19	–	–	14	2	–	–	77
Notropis rubellus	16	2	–	25	–	–	5	–	–	1	–	–	–	–	–	–	–	–	49
Cyprinella spiloptera	65	33	44	186	1	4	6	–	–	27	–	–	–	–	–	–	–	–	366
Notropis stramineus	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3
Notropis volucellus	1	1	1	–	1	1	–	–	–	–	–	–	–	–	–	–	–	–	5
Cyprinella whipplei	16	–	–	90	–	–	2	–	–	–	–	–	–	–	–	–	–	–	108
Phoxinus erythrogaster	–	–	–	–	–	–	–	–	–	1	–	–	–	18	–	–	–	–	19
Pimephales notatus	71	38	303	166	168	302	70	–	2	348	135	3	1	–	15	–	–	55	1677
Rhinichthys atratulus	–	–	–	–	2	–	–	–	–	–	–	–	12	–	–	–	–	–	14
Semotilus atromaculatus	–	–	–	–	2	–	–	17	–	8	–	–	6	19	4	–	1	12	69
Catostomus commersoni	–	–	–	–	–	–	–	–	–	3	–	–	–	2	–	–	1	–	6
Hypentilium nigricans	6	–	4	–	4	–	–	–	1	9	–	1	–	–	–	–	2	3	30
Moxostoma erythrurum	–	–	1	–	–	–	2	–	1	–	–	7	–	–	–	–	–	2	13
Moxostoma macrolepidotum	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	2
Ameiurus natalis	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Noturus miurus	–	3	–	1	1	1	2	–	3	10	–	–	–	–	–	–	–	–	21
Pylodictis olivaris	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2
Fundulus notatus	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4
Labidesthes sicculus	197	256	35	45	3	16	10	1	1	2	4	6	–	–	–	–	–	–	576
Ambloplites rupestris	6	–	10	8	24	8	7	–	11	17	–	2	–	–	–	–	4	–	97
Lepomis cyanellus	1	–	1	–	2	2	–	–	2	–	–	–	–	–	–	–	4	–	12
Lepomis gulosus	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Lepomis macrochirus	5	–	6	4	7	10	–	–	–	–	1	–	–	–	1	–	–	–	34
Lepomis megalotus	51	2	52	38	53	61	27	3	25	13	24	9	3	–	2	–	6	2	371
Micropterus dolomieu	–	–	–	–	1	–	–	–	–	1	–	–	–	–	3	4	–	–	9
Micropterus punctulatus	9	1	4	10	9	1	9	6	–	–	2	1	–	–	–	–	–	–	52
Micropterus salmoides	–	–	–	1	4	–	–	–	–	–	–	–	–	–	–	–	–	–	5
Etheostoma blennioides	19	1	7	3	2	–	–	4	7	5	–	–	–	–	–	–	–	–	48
Etheostoma caeruleum	4	–	5	11	3	–	10	18	27	57	1	6	1	–	3	6	–	3	155
Etheostoma flabellare	26	2	12	14	8	1	9	18	33	43	1	1	3	2	–	–	–	12	185
Etheostoma nigrum	2	–	5	–	3	21	3	11	–	71	9	5	1	–	–	–	–	2	133
Etheostoma spectabile	1	–	–	–	–	–	–	–	1	1	–	–	3	29	1	–	–	–	36
Etheostoma variatum	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	1
Etheostoma zonale	30	9	24	42	13	–	4	3	14	11	1	–	–	–	–	–	–	–	151
Percina caprodes	4	–	4	2	2	1	2	–	–	–	–	–	–	–	–	–	–	–	15
Percina maculata	1	–	1	–	–	1	1	–	4	6	–	–	–	–	–	–	–	–	14
Percina sciera	–	–	1	–	1	1	1	–	–	–	–	–	–	–	–	–	–	–	4
Cottus bairdi	–	–	–	–	–	–	–	2	2	2	–	–	–	–	–	–	–	–	6
N. rubellus x *L. chrysocephalus*	–	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	2
L. macrochirus x *L. cyanellus*	–	–	–	1	2	–	–	–	–	–	–	–	–	–	–	–	7	–	10
L. megalotus x *L. cyanellus*	–	–	–	1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	2
Total Species	29	15	22	24	30	19	24	15	22	28	13	12	12	9	11	5	8	12	
Total Individuals	585	415	556	777	531	512	285	227	173	1401	224	129	145	209	157	19	53	286	6684

*Two collections.

TABLE 3

Fish species recorded from the Scioto Brush Creek drainage through 1985.

Species	Trautman 1921–55	Trautman 1955–79	OEPA ODOT 1979–84	ODOW* 1985	Cavender Rice 1985
Anguilla rostrata	–	–	–	+	–
Lampetra aepyptera	+	+	+	–	+
Alosa chrysochloris	–	+	–	–	–
Dorosoma cepedianum	–	+	–	+	–
Lepisosteus osseus	+	–	–	+	–
Lepisosteus platostomus	–	+	–	–	–
Esox americanus	+	+	+	–	+
Esox masquinongy	+	–	–	+	–
Cyprinus carpio	–	+	+	–	–
Campostoma anomalum	+	+	+	–	+
Clinostomus funduloides	+	–	+	–	+
Notropis buccatus	+	+	+	–	+
Notropis amblops	+	–	–	–	–
Macrhybopsis storeriana	–	+	–	–	–
Nocomis micropogon	+	–	+	–	+
Notemigonus crysoleucas	+	+	+	–	–
Lythrurus ardens	+	+	+	–	+
Notropis atherinoides	+	+	–	–	–
Notropis blennius	–	+	–	–	–
Notropis ariommus	–	–	+	–	+
Luxilus chrysocephalus	+	+	+	–	+
Notropis photogenis	+	+	+	–	+
Notropis rubellus	+	+	+	–	+
Cyprinella spiloptera	+	+	+	–	+
Notropis stamineus	+	+	–	–	+
Notropis volucellus	+	–	–	–	+
Cyprinella whipplei	+	+	–	–	+
Phoxinus erythrogaster	+	+	–	–	+
Pimephales notatus	+	+	+	–	+
Pimephales vigilax	+	–	–	–	–
Phenacobius mirabilis	+	+	–	–	–
Rhinichthys atratulus	+	+	–	–	+
Semotilus atromaculatus	+	+	+	–	+
Carpiodes cyprinus	–	–	+	–	–
Catostomus commersoni	+	–	–	–	+
Hypentelium nigricans	+	+	+	–	+
Moxostoma anisurum	+	–	+	+	–
Moxostoma erythrurum	+	–	+	+	+
Moxostoma macrolepidotum	–	–	+	+	+
Moxostoma duquesnei	–	–	+	–	–
Minytrema melanops	–	–	+	+	–
Ictalurus punctatus	+	–	–	+	–
Ameiurus natalis	–	–	+	–	+
Noturus miurus	+	–	+	–	+
Plyodictis olivaris	+	–	–	+	+
Percopsis omiscomaycus	+	–	+	–	–
Fundulus notatus	+	+	–	–	+
Labidesthes sicculus	+	+	+	–	+
Ambloplites rupestris	+	+	+	+	+
Lepomis cyanellus	+	–	+	–	+
Lepomis gulosus	–	–	–	–	+
Lepomis macrochirus	+	+	+	+	+
Lepomis megalotis	+	+	+	+	+
Micropterus dolomieu	+	+	+	–	+
Micropterus punctulatus	+	+	+	+	+
Micropterus salmoides	+	–	–	–	+
Pomoxis annularis	+	–	–	+	–
Etheostoma blennioides	+	+	+	–	+
Etheostoma caeruleum	+	+	+	–	+
Etheostoma flabellare	+	+	+	–	+
Etheostoma nigrum	+	+	+	–	+
Etheostoma spectabile	+	–	–	–	+
Etheostoma variatum	+	–	+	–	+
Etheostoma zonale	+	+	+	–	+
Percina caprodes	+	+	+	–	+
Percina maculata	+	–	+	–	+
Percina sciera	–	–	–	–	+
Aplodinotus grunniens	–	+	+	–	–
Cottus bairdi	+	–	–	–	+
N. rubellus x *L. chrysocephalus*	–	–	+	–	+
L. macrochirus x *L. cyanellus*	–	–	–	–	+
L. macrochirus x *L. megalotis*	–	–	+	–	–
L. megalotis x *L. cyanellus*	–	–	+	+	–
Total Species = 69 + hybrids	53	39	42	15	47

*hoop nets + = species collected - = species not collected

1984, was found to occupy most of the main channel of Scioto Brush Creek from Otway downstream to its confluence with the Scioto River.

Catalogued museum records show 18 collections were made in the drainage between 1921 and 1947 with 49 species recorded while Trautman (1957) showed 53 species recorded from the watershed prior to 1955 (Table 3). Miscellaneous surveys by a variety of investigators between 1955 and 1980 as indicated in Trautman (1981) added seven additional species to the list for Scioto Brush Creek including the common carp (*Cyprinus carpio*), and transient species including: the shortnose gar (*Lepisosteus platostomus*), skipjack herring (*Alosa chrysochloris*), gizzard shad (*Dorosoma cepedianum*), silver chub (*Macrhybopsis storeriana*), river shiner (*Notropis blennius*), and freshwater drum (*Aplodinotus grunniens*). The majority of these transients represent larger river species that periodically enter the lower sections of Scioto Brush Creek from the Scioto River. Collecting by OEPA and ODOT crews at several sites in the drainage between 1979 and 1984 added 6 new species to the list for Scioto Brush Creek including the popeye shiner (*Notropis ariommus*), quillback carpsucker (*Carpiodes cyprinus*), shorthead redhorse (*Moxostoma macrolepidotum*), black redhorse (*Moxostoma duquesnei*), spotted sucker (*Minytrema melanops*), and yellow bullhead (*Ameiurus natalis*). In 1985 one additional species, the American eel (*Anguilla rostrata*), was captured in a hoop net set in Scioto Brush Creek at Arion, Ohio, by the Ohio Division of Wildlife. As of 1985, the total species for the drainage is now known to number 69 (Table 3).

The early collecting provides evidence to show that the original fauna of Scioto Brush Creek was almost entirely intact as of 1985. Of the species originally recorded in the 1921-47 surveys only the bigeye chub (*Notropis amblops*) has not been taken during subsequent surveys. This species has disappeared from many streams in the Scioto basin and elsewhere throughout Ohio over the last 70 years. One other species, the bullhead minnow (*Pimephales vigilax*), which was also recorded in the 1921-47 surveys, is still known to be present in the drainage even though it has not been recorded in any of the subsequent surveys. We captured over 50 bullhead minnows at the mouth of Scioto Brush Creek in the fall of 1983.

The additions to the fauna that have been found since the 1921-47 surveys are most likely due to more thorough collecting and the use of different survey techniques including hoop nets and electrofishing in addition to seines. For unglaciated Appalachian Plateau drainages in Ohio of approximately 525 to 787 ha in drainage area a fauna of between 60 and 70 species is relatively high. Similar sized drainages in unglaciated portions of the Muskingum basin have lower species richness figures of between 50 and 60 species (Cavender and Ciola 1981). One fact shown by the early records is the rarity of certain species such as largemouth bass, bluegill and green sunfish that tend to be introduced through stocking in farm ponds.

DISCUSSION

It is evident from an examination of the trellis diagram (Fig. 2) constructed to determine the faunal similarities between sampling sites in this study that stations 14-19 overall have low indices of affinity compared to stations 1-13. This would suggest that these six samples have a different faunal composition from the first 13 samples. This is not surprising in that samples 14-19 are all from smaller tributary streams which usually exhibit a different community makeup than that found in larger streams. Stations 10, 11, and 12 however, also exhibit relatively high indices of affinity with 4 of the 6 stations (14, 16, 17, 18) located on feeder streams to Scioto Brush and South Fork Scioto Brush creeks. The drainage areas of these upper mainstem stations could represent a zone of transition, particularly during periods of low flow as was the case during this study, in which species common to both communities (headwaters and mainstem) are mixing. The overall low indices of affinity found when stations 14-19 are compared among themselves was unexpected. One would expect these tributary streams to have similar fish faunas which should result in high indices of affinity. These low indices are more likely a result of insufficient sampling effort in these tributaries and more importantly, a disruption of the fish communities in these tributaries by drought and low flow conditions. Many of the smaller tributaries examined at the time of this study appeared to be completely dry.

The average index of affinity value for all possible sample pairs (171) in this study was 51.2. If the 6 tributary stations are excluded, the index value for the 13 mainstem stations (78 sample pairs) becomes 62.8. This value rates very favorably with the values obtained from similar types of studies done on insect and invertebrate communities. Sanders (1960) obtained values of 56.6 for all samples in his study area and a value of 69.3 for those stations exhibiting high faunal affinities.

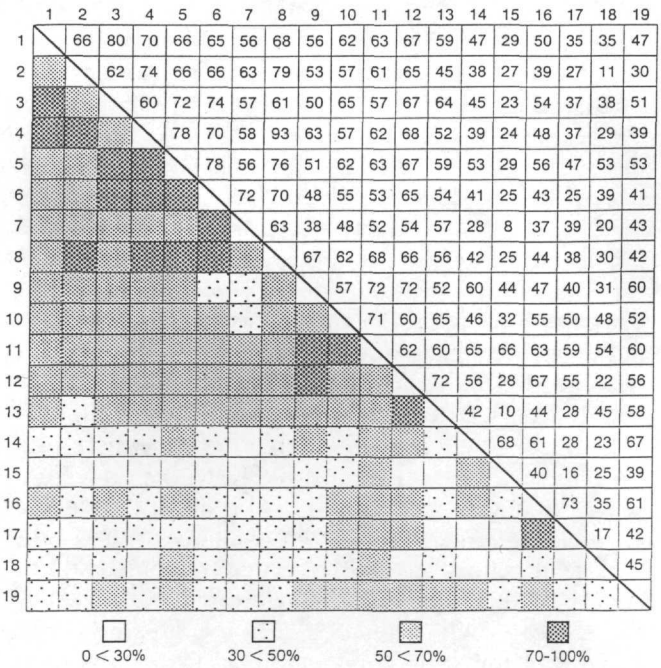

FIGURE 2. Trellis diagram showing the degree of faunal similarity among the 19 collecting stations in the Scioto Brush Creek drainage.

The community structure for the South Fork and mainstem sampling stations as determined by the Biological Index Value calculations (Table 4) was comparable to the community structure based on numerical abundance (Table 5). The 14 species with the highest BIV scores are also among the 15 most abundant species. There are some interesting differences within these top 15 rankings, however. The longear sunfish (*Lepomis megalotis*) ranks fifth in numerical abundance (6.2%), but based on the faunal frequency evaluation is the third ranking species on the community with a BIV value of 72, four points behind the striped shiner (*Luxilus chrysocephalus*) which was, numerically, the second most abundant species at 19.2%. The steelcolor shiner (*Cyprinella whipplei*) which ranked twelfth in numerical abundance (1.9%) was collected at only 3 of the 13 mainstem sites resulting in a BIV value of 9. *Cyprinella whipplei*, in spite of its numerical abundance, would not be considered a consistent component of the fish community in Scioto Brush Creek.

The numerical data presented in Table 5 show that the fish community in the Scioto Brush Creek mainstem is dominated by a relatively few species. Two species, *Pimephales notatus* and *Luxilus chrysocephalus*, comprise 27.6% and 19.2%, respectively, of the total number of individuals captured during this survey. These 2 species along with *Labidesthes sicculus* (9.9%), *Cyprinella spiloptera* (6.3%), and *Lepomis megalotis* (6.2%) comprise 69.2% of the fish fauna present at the collecting sites in the mainstem of Scioto Brush Creek and the South Fork Scioto Brush. Dominance is less pronounced below these 5 species with the next 9 species comprising only 22.1% of the total fish fauna. These 14 species together comprise 91.3% of all individuals captured in this study.

It is interesting to note that the popeye shiner, a species not previously recorded from the drainage before 1984, ranked eighth in abundance among the 47 species of fish collected in the present survey. *Notropis ariommus* was found at 6 stations in Scioto Brush Creek from Otway (Brush Township, Scioto County) at the confluence with South Fork downstream to a station approximately 2.4 km below McDermott (Rush Township, Scioto County). Although Scioto Brush Creek had been sampled previously (Trautman 1981) at many of the same stations established during the present study, this was the first time the mainstem including the South Fork had been systematically surveyed. It is not known why, with the exception of the South Fork OEPA collection made in 1984, *Notropis ariommus* was missed by earlier collectors, since in 1985 it was not uncommon in the mainstem. A check of all catalogued cyprinid voucher specimens from Scioto Brush Creek in The Ohio State University Museum of Zoology proved negative for this species. It could be speculated that low rainfall conditions and the drying up of most of the feeder streams to Scioto Brush Creek during the fall of 1985 may have concentrated *Notropis ariommus* in the lower mainstem making it easier to collect. *Notropis*

TABLE 4

Faunal frequency evaluation of the mainstem and South Fork collection sites on Scioto Brush Creek.

Species	Species Abundance Rank Within a Collection*										Total # Sites Present At	# of Sites as 1 of 10 Most Common Species	Biological Index Value**
	1	2	3	4	5	6	7	8	9	10			
Pimephales notatus	5	3	1					1			11	10	88
Luxilus chrysocephalus	2	3		2	2			1			11	10	76
Lepomis megalotis		1	6	1			1		1		12	10	72
Labidesthes sicculus	2			1	3		2				12	8	53
Lythrurus ardens	1	1		1	1	2				1	9	7	43
Cyprinella spiloptera	1		2	1			1		1		8	6	39
Etheostoma caeruleum		1		2		1		1		1	10	6	35
Etheostoma flabellare	1				1	2	1				12	5	30
Etheostoma zonale					2	3		1			10	6	30
Notropis ariommus		1		2		1			1		5	5	30
Etheostoma nigrum			1	1	1		2				9	5	29
Campostoma anomalum					2		1	1	2	2	11	8	25
Notropis photogenis		1				2	1			1	8	5	24
Ambloplites rupestris							2	3	1		9	6	19
Nocomis micropogon			1							1	5	2	9
Cyprinella whipplei			1							1	3	2	9
Notropis buccata		1									2	1	9
Etheostoma blennioides								2	1		8	3	8
Micropterus punctulatus								1	2	1	10	4	8
Moxostoma erythrurum				1							4	1	7
Lepomis macrochirus							1			2	6	3	6
Notropis rubellus									2	1	4	3	5
Semotilus atromaculatus						1					3	1	5
Noturus miurus								1			6	1	3
Percina maculata									1		6	1	2
Hypentelium nigricans										1	6	1	1

* Entries under this category equal total number of collections within rank (max. no. = 12).

** BIV scores are calculated by assigning a point value to each rank (10 points for each collection with a rank of 1; 9 points for each collection with a rank of 2, etc.) and summing the points for each species.

ariommus was only collected at those sites located on the mainstem below the confluence with the South Fork. These sites were probably resident locations since at each station where adult popeye shiners were taken, young of the year were also found. Surveys of headwater tributaries in this drainage for the rosyside dace (*Clinostomus funduloides*) by Rice and Phinney (1985) in 1980-81, when flows were more normal, also failed to capture *Notropis ariommus* in these smaller stream systems.

Elsewhere in this region of the Ohio River Basin a disjunct population of *Notropis ariommus* was recently located in Kinniconick Creek, a direct tributary to the Ohio River located in northeastern Kentucky opposite Scioto County, Ohio (Warren and Cicerello 1983). Other Kentucky populations were restricted primarily to the upper Green, Barren, Rolling Fork of the Salt River, Cumberland and Kentucky River drainages in southeastern and south-central Kentucky (Burr and Warren 1986).

CONCLUSIONS

One of the objectives of this study was to determine whether or not a rapid, low cost sampling method employing seines on a moderate-sized stream such as Scioto Brush Creek would provide an accurate assessment of the resident fish populations. These data could then be used as part of a long term project to monitor the status of state-listed fish species. Based upon the historic fish data available for our study stream and available data for similar sized drainages in southern Ohio, our survey results appear to provide an accurate representation of the resident fish populations in Scioto Brush Creek. Because data obtained from seining is often weighted toward smaller fish, the numerical data needed to structure the fish community can be somewhat deficient. Species associated with cover such as woody debris or undercut banks which restrict the efficiency of seines are likely to be underrepresented in a survey of this type. Species and individuals frequenting larger pools, such as many of the suckers and centrarchids, may also be under represented in a survey of this type due to their evasive abilities. For those species which reproduce in the stream however, surveys of this type conducted during periods of low flow should capture juveniles of these larger, more elusive species. Overall the use of seines as a method

TABLE 5

The structure of the fish community in the Scioto Brush Creek mainstem based on numerical abundance.

Rank by No.	Species	No. Coll.	% of Fauna by No.	Cumulative % by No.
1	*Pimephales notatus*	1606	27.64	27.64
2	*Luxilus chrysocephalus*	1118	19.24	46.88
3	*Labidesthes sicculus*	576	9.91	56.79
4	*Cyprinella spiloptera*	366	6.30	63.09
5	*Lepomis megalotis*	358	6.16	69.25
6	*Lythrurus ardens*	204	3.51	72.76
7	*Etheostoma flabellare*	180	3.10	75.86
8	*Notropis ariommus*	174	2.99	78.85
9	*Etheostoma zonale*	151	2.60	81.45
10	*Etheostoma caeruleum*	142	2.44	83.89
11	*Etheostoma nigrum*	130	2.24	86.13
12	*Cyprinella whipplei*	108	1.86	87.99
13	*Campostoma anomalum*	100	1.72	89.71
14	*Ambloplites rupestris*	93	1.60	91.31
15	*Notropis photogenis*	61	1.05	92.36
16	*Micropterus punctulatus*	52	0.90	93.26
17	*Nocomis micropogon*	49	0.84	94.10
18	*Notropis rubellus*	49	0.84	94.94
19	*Etheostoma blennioides*	48	0.84	95.77
20	*Notropis buccata*	39	0.67	96.44
21	*Lepomis macrochirus*	33	0.57	97.01
22	*Semotilus atromaculatus*	27	0.46	97.47
23	*Noturus miurus*	21	0.36	97.83
24	*Hypentelium nigricans*	20	0.34	98.17
25	*Percina caprodes*	15	0.26	98.43
26	*Percina maculata*	14	0.24	98.64
27	*Moxostoma erythrurum*	11	0.19	98.86
28	*Lepomis cyanellus*	8	0.19	99.00
29	*Cottus bairdi*	6	0.10	99.10
30	*Notropis volucellus*	5	0.09	99.19
31	*Micropterus salmoides*	5	0.09	99.28
32	*Fundulus notatus*	4	0.07	99.35
33	*Percina sciera*	4	0.07	99.42
34	*Lampetra aepyptera*	3	0.05	99.47
35	*Notropis stramineus*	3	0.05	99.52
36	*Catostomus commersoni*	3	0.05	99.57
37	*Etheostoma spectabile*	3	0.05	99.62
38	*L. macrochirus* x *L. cyanellus*	3	0.05	99.67
39	*Esox americanus*	2	0.03	99.70
40	*N. rubellus* x *L. chrysocephalus*	2	0.03	99.73
41	*Rhinichthys atratulus*	2	0.03	99.76
42	*Ameiurus natalis*	2	0.03	99.79
43	*Pylodictis olivaris*	2	0.03	99.82
44	*Micropterus dolomieu*	2	0.03	99.85
45	*L. megalotis* x *L. cyanellus*	2	0.03	99.88
46	*Clinostomus funduloides*	1	0.02	99.90
47	*Phoxinus erythrogaster*	1	0.02	99.92
48	*Moxostoma macrolepidotum*	1	0.02	99.94
49	*Lepomis gulosus*	1	0.02	99.96
50	*Etheostoma variatum*	1	0.02	99.98

Total Individuals = 5811

of providing an accurate portrayal of the fish community in a stream such as Scioto Brush Creek appears to be a valid survey technique so long as one understands the advantages and drawbacks of data gathered in this manner. The use of seines alone might not provide an accurate picture in the case of streams characterized by extensive amounts of woody debris, boulders, slabrock, and other forms of structure which impede the use of seines. Fish communities present in larger rivers such as the Scioto or Muskingum, or in deeper pools as found in the lower reaches of Scioto Brush Creek, may also not be accurately portrayed by a single collection method. The use of seines does appear to provide a reasonably accurate picture of the fish community present in small to moderate-size streams such as those in the Scioto Brush Creek drainage.

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